



Complete Summary

GUIDELINE TITLE

ACR Appropriateness Criteria™ for vertigo and hearing loss.

BIBLIOGRAPHIC SOURCE(S)

Hasso AN, Drayer BP, Anderson RE, Braffman B, Davis PC, Deck MD, Johnson BA, Masaryk T, Pomeranz SJ, Seidenwurm D, Tanenbaum L, Masdeu JC. Vertigo and hearing loss. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun; 215(Suppl): 471-8. [21 references]

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SCOPE

DISEASE/CONDITION(S)

- Vertigo
- Hearing loss

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Neurology
Otolaryngology
Radiology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for vertigo and hearing loss

TARGET POPULATION

Patients with vertigo and hearing loss

INTERVENTIONS AND PRACTICES CONSIDERED

1. Magnetic resonance:
 - without contrast
 - with contrast
2. Computed tomography:
 - without contrast
 - with contrast
 - air/contrast cisternography
3. X-ray:
 - skull films
 - tomography

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of recent peer-reviewed medical journals, primarily using the National Library of Medicine's MEDLINE database. The developer identified and collected the major applicable articles.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Delphi Method)
Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed to reach agreement in the formulation of the Appropriateness Criteria. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty (80) percent agreement is considered a consensus. If consensus cannot be reached by this method, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria and the Chair of the ACR Board of Chancellors.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria™

Clinical Condition: Hearing Loss/Vertigo

Variant 1: Sensorineural hearing loss, acute vertigo.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Magnetic resonance		
No contrast	8	
(+) contrast	7	
Computed tomography		
No contrast	5	For possible cholesteatoma with labyrinthine fistula.
(+) contrast	3	
Air/contrast cisternography	2	
X-ray		
Skull films	2	
Tomography	2	
<u>Appropriateness Criteria Scale</u>		
1 2 3 4 5 6 7 8 9		
1=Least appropriate 9=Most appropriate		

Clinical Condition: Hearing Loss/Vertigo

Variant 2: Sensorineural hearing loss, intermittent vertigo.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Magnetic resonance		
No contrast	8	
(+) contrast	8	
Computed tomography		
No contrast	5	
(+) contrast	2	
Air/contrast cisternography	2	
X-ray		
Skull films	2	
Tomography	2	
<u>Appropriateness Criteria Scale</u> 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Clinical Condition: Hearing Loss/Vertigo

Variant 3: Sensorineural hearing loss, no vertigo.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Magnetic resonance		
No contrast	8	
(+) contrast	8	
Computed tomography		
No contrast	5	
(+) contrast	4	
Air/contrast cisternography	2	

X-ray		
Skull films	2	
Tomography	2	
<p align="center"><u>Appropriateness Criteria Scale</u></p> <p align="center">1 2 3 4 5 6 7 8 9</p> <p align="center">1=Least appropriate 9=Most appropriate</p>		

Clinical Condition: Hearing Loss/Vertigo

Variant 4: Conductive hearing loss, Rule out (R/O) petrous bone abnormality.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Computed tomography		
No contrast	8	
(+) contrast	4	
Air/contrast cisternography	2	
Magnetic resonance		
No contrast	4	Magnetic resonance may be helpful if dural extension is suspected.
(+) contrast	4	
X-ray		
Skull films	2	
Tomography	2	
<u>Appropriateness Criteria Scale</u>		
1 2 3 4 5 6 7 8 9		
1=Least appropriate 9=Most appropriate		

Clinical Condition: Hearing Loss/Vertigo

Variant 5: Episodic vertigo, new onset (hours to days).

Radiologic Exam Procedure	Appropriateness Rating	Comments
Magnetic resonance		
No contrast	7	
(+) contrast	6	
Computed tomography		
No contrast	4	
(+) contrast	2	
Air/contrast cisternography	2	
X-ray		
Skull films	2	
Tomography	2	
<p align="center"><u>Appropriateness Criteria Scale</u></p> <p align="center">1 2 3 4 5 6 7 8 9</p> <p align="center">1=Least appropriate 9=Most appropriate</p>		

Clinical Condition: Hearing Loss/Vertigo

Variant 6: Vertigo, no hearing loss, normal neurological exam.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Magnetic resonance		
No contrast	8	
(+) contrast	7	
Computed tomography		
No contrast	4	
(+) contrast	2	
Air/contrast cisternography	2	
X-ray		
Skull films	2	

Tomography	2	
<u>Appropriateness Criteria Scale</u> 1 2 3 4 5 6 7 8 9 1 =Least appropriate 9=Most appropriate		

Clinical Condition: Hearing Loss/Vertigo

Variant 7: Total deafness, cochlear implant candidate, surgical planning.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Computed tomography		
No contrast	9	
(+) contrast	2	
Air/contrast cisternography	2	
Magnetic resonance		
No contrast	4	
(+) contrast	4	
X-ray		
Skull films	2	
Tomography	2	
<u>Appropriateness Criteria Scale</u> 1 2 3 4 5 6 7 8 9 1 =Least appropriate 9=Most appropriate		

Clinical Condition: Hearing Loss/Vertigo

Variant 8: Fluctuating hearing loss, history of meningitis or to rule out congenital anomaly.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Magnetic resonance		

No contrast	8	
(+) contrast	6	
Computed tomography		
No contrast	8	
(+) contrast	3	
Air/contrast cisternography	2	
X-ray		
Skull films	2	
Tomography	2	
<p style="text-align: center;"><u>Appropriateness Criteria Scale</u></p> <p style="text-align: center;">1 2 3 4 5 6 7 8 9</p> <p style="text-align: center;">1=Least appropriate 9=Most appropriate</p>		

Summary

Dizziness is a common clinical complaint. It accounts for 1% of visits to United States office-based physicians. Vertigo is a form of dizziness in which there is an illusion of movement (rotation, tilt, or linear translation). The mechanism for vertigo is due to an imbalance of tonic vestibular signals. Thus, vertigo is a hallucination of movement and represents a symptom of a disturbed vestibular system.

The complete vestibular system comprises the end organs in the temporal bone, the vestibular components of the VIIIth cranial nerve, and the central connections in the brainstem. The end organs in the temporal bones are the cristae of the three semicircular canals that respond to movement of the head and the macula of the utricle, which records the position of the head. The semicircular canals record dynamic actions and the utricle records static function. Vertigo is subdivided into peripheral vertigo (due to failure of the end organs) or central vertigo (due to failure of the vestibular nerves or central connections to the brainstem and cerebellum).

Peripheral Vestibular Disorders

Patients with benign positional vertigo describe episodic vertigo lasting less than a minute, brought on by movements of the head and without other associated symptoms. There are no radiological findings in patients with benign positional vertigo.

In Ménière's disease, paroxysmal attacks of whirling vertigo are usually accompanied by nausea, and are transient, lasting a few hours but not days. The

severe episodic vertigo is accompanied by tinnitus, fluctuating hearing loss, and a feeling of fullness in the affected ear or ears. Typically, hearing decreases and tinnitus increases during the attack. Hearing may improve between attacks in early stages of the disease. Generally, the hearing loss begins unilaterally and affects the lower frequencies primarily; mid and high frequencies are being affected in later stages of the disease.

Ménière's disease is most common in middle age and may become bilateral in up to 50% of the affected patients. The etiology of Ménière's disease is a failure of the mechanism regulating the production and disposal of endolymph, resulting in recurrent attacks of endolymphatic hydrops. Since the endolymphatic duct and sac are the sites of resorption of endolymph, these structures play an important role in the pathogenesis of endolymphatic hydrops. The success of various surgical procedures in relieving Ménière's disease symptoms has led to great interest in using computed tomography, or magnetic resonance imaging, or both, to evaluate the vestibular aqueduct, endolymphatic duct, and sac.

Unfortunately, there is no unanimity on the value of imaging in cases of Ménière's disease. Some investigators have used computed tomography or magnetic resonance imaging to prognosticate results of shunt surgery, based on showing patency of the vestibular aqueduct. Other investigators, however, report that the size, shape, and patency of the vestibular aqueduct are of no value in predicting surgical results in shunt procedures or in predicting occurrence of bilateral disease. Magnetic resonance imaging, with its ability to detect the endolymphatic duct and sac separate from the bony vestibular aqueduct, may offer more useful information than computed tomography. The value of computed tomography and magnetic resonance imaging may be in their ability to rule out associated infectious or neoplastic disease processes.

Vestibular neuronitis is a clinical diagnosis based on an aggregate of specific symptoms. The disease is characterized by an acute onset of severe vertigo, lasting several days, followed by gradual improvement over several weeks. Hearing is typically unaffected. The history includes onset of vertigo following an illness such as an upper respiratory infection. Most patients become completely symptom free following central compensation. Vestibular labyrinthitis is similar, because the disease presents with the acute symptoms of vertigo but is always associated with hearing loss. Labyrinthitis is usually viral in origin but may result from acute or chronic bacterial middle ear infections. Unlike viral labyrinthitis, labyrinthitis associated with suppurative ear disease may progress to develop partial or complete occlusion of the lumen of the affected labyrinth. Early on, the obstructed lumen may be detected on magnetic resonance (MR) imaging because of loss of the signal intensity of the fluid contents. Later on, more complete obliteration of all the labyrinthine structures occurs with an end result of labyrinthitis obliterans, which is readily diagnosed on computed tomography or conventional tomography.

With magnetic resonance imaging, there may be post-gadolinium enhancement of the labyrinthine structures or vestibular nerves during the acute or subacute stages of vestibular neuronitis, or labyrinthitis, or both. Such results must be interpreted with care, because sudden labyrinthine dysfunction may be caused by spontaneous hemorrhage or injury, which results in abnormal signal intensities within the labyrinthine structures secondary to the blood products.

Diseases of the internal auditory canal and cerebellopontine angle are generally not characterized by severe attacks of vertigo, but rather with intermittent dizziness, or exacerbated periods of dizziness, or both. A variety of benign or malignant tumors of the petrous temporal bone, such as paragangliomas, carcinomas, or metastatic tumors, may directly involve the labyrinthine structures, causing vertigo. Such processes are readily evaluated with modern imaging techniques.

Central Vestibular Disorders

Lesions of the brainstem or cerebellum that result in central vertigo can readily be diagnosed by magnetic resonance imaging. Vascular insufficiency in the vertebrobasilar circulation is a common cause of vertigo in patients older than age 50. Thrombosis of the labyrinthine artery or infarction of the lateral medulla from vertebral or posterior inferior cerebellar artery insufficiency may cause severe vertigo. Subclavian steal syndrome can cause a variety of symptoms, including vertigo. Such conditions can be carefully evaluated with magnetic resonance angiography or conventional angiography of the posterior fossa vasculature.

A variety of other central nervous diseases may produce vertigo or dizziness. These include seizure disorders, multiple sclerosis, ataxic diseases, head injuries, or any cause for increased intracranial pressure. Vertigo may result as a sequela of stroke and transient ischemic attacks may present as episodic dizziness.

Various metabolic disorders may result in dizziness. These include thyroid disorders, hyperlipidemia, diabetes, and hypoglycemia. Autoimmune diseases or diseases that affect the proprioceptive system may cause vertigo. In many cases, the possibility of functional neurotic symptoms must be considered in patients in whom no disease can be found. Finally, cervical spondylosis is thought to cause vertigo by disc degeneration and narrowing of the disc space, which affects nearby nerves, or by osteophyte formation, which compresses the blood vessels. In such cases, conventional radiographs, or cross-sectional imaging procedures, or both may be helpful.

Sensorineural Hearing Loss

Sensorineural hearing loss may be sudden, fluctuating, or progressive. Sudden sensorineural hearing loss is a manifestation of viral infections, vascular occlusive diseases, or inner-ear membrane ruptures. As discussed above, vertigo may be associated with these conditions, which would help define whether the lesion is peripheral or central. To discriminate between idiopathic or viral infections from other causes of sensorineural hearing loss, auditory brainstem responses and gadolinium-enhanced magnetic resonance imaging may be used. Patients with cochleitis or cochlear nerve neuritis typically have abnormal auditory brainstem responses and may be helped by a tapering course of oral corticosteroids. Whether or not gadolinium enhanced magnetic resonance imaging shows enhancement of the cochlear nerve or cochlea is not a helpful indicator for or against using corticosteroid therapy. However, one paper suggests that magnetic resonance imaging of positive sudden deafness is more difficult to cure with steroid therapy than magnetic resonance imaging of negative sudden deafness.

Fluctuating neurosensory hearing loss is a difficult disease to work up properly. The audiometric examination would, of course, indicate the level of dysfunction, but not the likely cause. Of interest are patients who on imaging are noted to have large vestibular aqueducts (apertures greater than 4 mm), which may indicate a congenital cause for fluctuating hearing loss. Such patients with large vestibular aqueducts have high frequency loss more often than low frequency loss. Fluctuating sensorineural hearing loss due to an enlarged vestibular aqueduct appears to be more common in children and young adults which is an important point in differentiating this disease from Ménière's disease, in which most patients are middle aged or older. Of interest is that the vestibular aqueduct of patients with Ménière's disease may be small, rather than large.

There is speculation on the causes of a sudden drop in hearing in patients with large vestibular aqueducts. Two possible causes are reflux of hyperosmolar fluid from the endolymphatic sac to the inner ear and rupture of the membranous labyrinth or a perilymphatic fistula due to transmission of intracranial pressure to the inner ear through the enlarged vestibular aqueduct. It is well recognized that patients sustaining relatively minor head trauma, or patients who are subjected to extreme barotrauma (scuba diving) may aggravate their episodes of hearing loss. In such cases, it may be worthwhile to image the temporal bones to detect enlarged vestibular aqueducts and thus advise the patients or their parents of the dangers of contact sports or activities that entail extreme barometric pressure changes. The imaging findings must be correlated with audiometry, because the fluctuating sensorineural hearing loss of large vestibular aqueduct patients does not resemble the low frequency changes characteristic of Ménière's disease, which may also be associated with fluctuating hearing loss.

Patients with isolated large vestibular aqueducts may have a different pathophysiologic basis than patients whose large aqueducts are associated with other inner-ear malformations. Cases with complex inner ear malformations may be subject to recurrent episodes of meningitis, or the "gusher" syndrome, or both, resulting in a dead ear at the time of surgical intervention such as a stapedectomy.

Asymmetric sensorineural hearing loss or gradually declining unilateral sensorineural hearing loss is a common symptom that may be ascribed to many different pathologic processes. Initial evaluation is geared to localizing the site of the lesion, i.e., cochlear or retrocochlear. All retrocochlear lesions are associated with an abnormal auditory brainstem response, which is often obtained before an imaging study. Whether auditory brainstem response testing should be eliminated, as a cost saving measure is a subject of considerable debate. It seems unlikely that clinicians will refer patients directly to magnetic resonance imaging, without at least preliminary audiometric, or auditory brain response testing, or both.

A complete magnetic resonance study of the head should be performed in addition to the studies of the internal auditory canal and temporal bones. The magnetic resonance examination should include complete evaluation of the central nuclei in the brainstem as well as the auditory pathways extending upward into the cerebral hemispheres. Whether gadolinium contrast enhancement is routinely used depends on many factors including coil size, field of view, field strength, and pulse sequences. Computed tomography is diagnostic in lesions 1-1.5 cm or

greater in diameter, but does not readily detect small brainstem lesions such as infarctions of demyelination.

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate selection of radiologic exams for patients with vertigo and hearing loss.

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Hasso AN, Drayer BP, Anderson RE, Braffman B, Davis PC, Deck MD, Johnson BA, Masaryk T, Pomeranz SJ, Seidenwurm D, Tanenbaum L, Masdeu JC. Vertigo and hearing loss. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):471-8. [21 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1996 (revised 1999)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria™.

GUIDELINE COMMITTEE

ACR Appropriateness Criteria™ Committee, Expert Panel on Neurologic Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Names of Panel Members: Thomas Masaryk, MD; Burton P. Drayer, MD; Robert E. Anderson, MD; Bruce Braffman, MD; Patricia C. Davis, MD; Michael D. F. Deck, MD; Anton N. Hasso, MD; Blake A. Johnson, MD; Stephen J. Pomeranz, MD; David Seidenwurm, MD; Lawrence Tanenbaum, MD; Joseph C. Masdeu, MD, PhD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline. It is a revision of a previously issued version (Appropriateness criteria for vertigo and hearing loss. Reston [VA]: American College of Radiology [ACR]; 1996. 8 p [ACR Appropriateness Criteria™]).

The ACR Appropriateness Criteria™ are reviewed after five years, if not sooner, depending upon introduction of new and highly significant scientific evidence. The next review date for this topic is 2004.

GUIDELINE AVAILABILITY

Electronic copies: Available from the [American College of Radiology \(ACR\) Web site](#).

Print copies: Available from ACR, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on July 31, 2001. The information was verified by the guideline developer as of August 24, 2001.

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The logo for FIRSTGOV, featuring the word "FIRST" in blue and "GOV" in red, with a small red star above the "I".

